

BOOK REVIEWS

SALINE MINERALS OF THE GREEN RIVER FORMATION, by JOSEPH J. FAHEY, U. S. Geological Survey Prof. Paper 405, U. S. Government Printing Office, Washington, 1962, vi+50 pages, 37 figs., \$.75.

A complete descriptive monograph of this sort is rarely seen in these days of heavy competition for journal space. The six carbonates described—shortite, trona, northupite, pirssonite, gaylussite and bradleyite—occur in large quantities in a playa evaporite of Eocene age in southwestern Wyoming. Shortite and bradleyite were first found in 1939 in a core from the center of this basin, and that core furnished most of the material described in this report. Since that time the trona deposit has been extensively developed by drilling and underground mining, and today it accounts for most of the natural soda ash produced in the United States.

Fahey has done an unusually complete job of measurements on the minerals, and seems to have spared none of these in the writing. The result is a definitive description that will be indispensable to anyone working with these minerals. Optical, physical and morphological descriptions are followed by chemical analyses (including a large number of trace elements), and there is an appendix by Mary Mrose with a new and complete set of *x*-ray powder data. Conditions of genesis in the sediments are discussed briefly. However, the significance of some of the observations, such as the Ridgway color of 14 core samples, and the fact that beryllium is 0.0012 per cent in trona but less than 0.0002 per cent in other minerals, escapes me. And *who* wants to know that “in the summer of 1939 that part of the core that penetrated the Wilkins Peak member of the Green River formation was transferred to four boxes—each containing six trays, the total weight being 1600 pounds—and sent to the Geological Survey in Washington, D. C., for detailed examination?” Discursive excursions of this sort, of which there are many in the paper, indicate (among other things) a lack of editorial diligence. Perhaps this is a good thing, as the U. S. Geological Survey has often been credited with an oversupply of that commodity.

Fahey is to be congratulated for telling us at least as much as we want to know about these minerals, and soon enough: this mineralogical work began twenty-three years ago, but at present rates the minerals won't be mined out for another one thousand years.

WILLIAM T. HOLSER
California Research Corporation

APPLIED CLAY MINERALOGY, by RALPH E. GRIM, McGraw-Hill Book Co., Inc., New York; 1962, viii+422 pages, \$12.50.

Applied Clay Mineralogy by Ralph Grim is a companion volume to his *Clay Mineralogy* (1953, McGraw-Hill Book Co.). As its name suggests, it treats of the application of the mineralogy of clays to the many uses to which clay minerals are put. Thus, it is not an encyclopedia of formulas in clay technology—instead, it approaches the utilization of clay minerals, and the reasons they are used and perform in certain ways, from consideration of their basic structure. It marks a step forward from practices of what have been criticized as undue empiricism in clay technology. Grim rightly differentiates between clay material, “any fine-grained, natural, earthy argillaceous material” in Chapter 1, and the structure and properties of clay minerals in Chapter 2. The condensed treatment of the more important structural and chemical properties of clay minerals is well presented in Chapter 2, and will be welcomed by many users of clays who are not interested in details of clay mineralogy for their own sake.

Chapter 3 treats of clays in ceramic products. The importance of plasticity is recognized by devoting more than eight pages of discussion to this topic. Under the role of

clay in foundry molding sands, in Chapter 4, the concept of bonding action of clay in sand is well discussed and illustrated. In Chapter 5 the mineralogy of clay is applied to soil mechanics, and is related to the vitally important engineering properties of clays as base materials for engineering structures.

Clay mineralogy in the petroleum industry, which includes clay materials as source rocks, catalysts, drilling mud, exploration guides and absorbents (also other oils than petroleum) is discussed in Chapters 6 and 7. More than thirty miscellaneous uses of clays are correlated with their mineralogy in Chapter 8.

Grim writes well and the results are easy to read. The material is organized logically, yet each chapter is sufficiently circumscribed that it is useful without requiring the reading of additional material. Observations are well documented and an extensive list of references follows each chapter.

The main criticism of the book has been anticipated by the author (page v), "The volume is very uneven in that some uses are considered in much more detail than others." As Grim writes further, "This is regrettable but unavoidable as there is substantially no technical literature about some uses." Trade secrets, classified government documents, and confidential information obviously can not be included. Nevertheless this volume is tremendously useful, meets an urgent needs, and Grim has done an excellent job. The publisher has likewise done an excellent job of printing; the price of the book is not low. Every clay mineralogist and industrial user of clay materials needs this book.

W. D. KELLER
University of Missouri

CRYSTALLIZATION, THEORY AND PRACTICE by ANDREW VANHOOK. ACS Monograph No. 152, Reinhold Publishing Corporation, New York, 1961. 325 pp. \$12.50.

Crystallization, Theory and Practice, by Andrew VanHook, Professor of Chemistry, College of the Holy Cross, Worcester, Massachusetts, is number 152 in the the American Chemical Society Monographs.

The first forty-four pages are devoted to historical review, followed by a discussion of the phase rule, a rather hasty introduction to geometrical and x-ray crystallography, followed by an excellent brief treatment of crystal habit and growth. The third chapter covers modern theories of crystal growth with Kossel's theory as a starting point. The following chapters are data on nucleation, growth and rate of growth; crystallization in the laboratory and plant; and the practice of crystallization. In these chapters a diversity of topics and interests is covered, from commercial sugar crystallization to the growth of single crystals for technological use.

The most valuable aspect of the book is the rather lengthy bibliography at the end of each of the six chapters, and the list of general references, review papers and symposia in the appendix. *Crystallization* is a reference that should be accessible to all whose work is related to the growth of crystals.

The book contains an author index and a subject index. The latter is not very complete. The reviewer could not find the following terms in the subject index; germanium, silicon, graphite and a number of other substances. A number of topics are placed in rather strange places. For example, diamond synthesis is found under the topic "Growth from Vapors, etc." Not all of the illustrations are well placed with respect to the related text. The work will certainly be referred to often in spite of some minor annoyances and omissions. The author is to be congratulated upon a job well done.

R. M. DENNING
The University of Michigan

CRYSTALLOMETRY by P. TERPSTRA AND L. W. CODD, Academic Press, New York, 1961. 420 pp.

Crystallography, by P. Terpstra, sometime Professor of Crystallography and Mineralogy in the University of Groningen, and L. W. Codd, is basically a revision and English translation of the senior author's 1946 work of the same title.

The book is written for the graduate student in crystallography, though it should be of great value to research workers in the field. In the preface to the first edition, the author states, "The student should remember that this is not a book to be read and learnt from cover to cover. Rather should he open it as fancy dictates and then proceed as necessary in search of facts." The reviewer, feeling that the author knew what he was writing about, took the advice seriously. Such reading proved most enjoyable and stimulating. Here is the work of a master of his chosen field, a man secure in his niche, who does not feel the need to impress the student with profound and impressive developments. He aids the student in understanding the principles, facts and procedures of crystal measurement and drawing. Once having opened the book, the student may well have difficulty in putting it down.

The style of writing is informal without sacrifice to rigor. The organization is rather casual and the book contains far more of classical crystallography than the title suggests. Among the twelve chapters, particular attention may be directed to the last, on Laue diagrams and particularly to Chapter VIII on matrix methods. Two new optical goniometers are described in some detail.

From the striking frontispiece by M. C. Escher to the fifty-one exercises at the end of the book, *Crystallography* is indeed a book to be picked up as "fancy dictates." More than this, the practical aspects of crystal drawing and measurement are thoroughly covered as is the best of classical crystallography in a modern treatment. The book is well illustrated with 273 figures and is very well printed. Before concluding the reviewer feels that he must mention that a rather subtle humor, which he found quite refreshing, pervades many of the pages. It is highly recommended to all who may profit from a better understanding of geometrical crystallography.

R. M. DENNING

The University of Michigan

ON THE EXTERNAL CHARACTERS OF MINERALS by A. G. WERNER. Translated by Albert V. Carozzi, University of Illinois Press, Urbana, Illinois, 1962. xxix+118 pp.

The following statements from the Preface and the Introduction concisely state the nature of this translation. "Upon its publication in 1774, *Von den ausserlichen Kennzeichen der Fossilien* created an immense scientific interest all over Europe and inspired increased investigations in the particular field it had so brilliantly renovated, that is, the determination and classification of minerals according to external characters."

"Though Werner failed to reach a true understanding of the structure and history of the earth, he made a basic and unchallenged scientific contribution when he wrote, in 1774, what is considered today as the first modern textbook on mineralogy. In this 300 page volume, Werner, only twenty five years old at the time, developed a completely new description of minerals. Indeed, he was the first to recognize that a true and final classification of minerals should be based on their chemical composition, and that it should be possible to identify the various minerals with certainty by their external characters and physical properties."

"The text presented here is the translation of the original of 1774 in which all the handwritten changes of Werner's personal copy as well as those listed in the addendum

and errata of the original have been incorporated. In other words, we have translated and annotated what would have been the second edition had Werner succeeded in getting it ready for publication."

LEWIS S. RAMSDELL

The University of Michigan

LAROUSSE ENCYCLOPEDIA OF THE EARTH by LEON BERTIN. Foreword by Sir Vivian Fuchs, Introduction by Carroll Lane Fenton, English translation by R. Bradshaw and Mary M. Owen. Prometheus Press, New York. 419 pp., 20 color plates, "More than 500 photographs and diagrams." \$15.00.

This popular rendition of geology, paleontology and pre-history is an up-to-date version of a French classic, completely revised by a panel of British and American editorial consultants: Norman Harris, Carroll Lane Fenton, Chalmer L. Cooper, Henry Hill Collins and Olivia V. Haslan-Perry. It is an authoritative and comprehensive summary of the structure, materials and history of our planet, directed primarily toward the informed layman, the beginning to intermediate student in geology and workers in other disciplines who seek both basic information and a perspective in geology. Profusely and handsomely illustrated, its pictorial exemplification is international in selection.

The book has three parts: *The Present*, with chapters on atmosphere and weathering, soil, ground water, running water, oceans and lakes, glaciation, vulcanism, earth movements, the earth's crust and its interior, diastrophism; *Earth in the Service of Man*, Minerals, fuels, water power and future energy sources; and *The Past*, containing chapters dealing with the universe, Precambrian, Paleozoic, Mesozoic and Cenozoic events and life, paleontology and the record of life.

The section on minerals and mineralogy is skimpy—under "Principal Minerals" are listed only the forms of SiO_2 , the main silicate groups and some carbonates! Yet four pages are devoted to gemstones. The only plutonic rock pictured is an orbicular diorite.

The chief objection to the book is its lack of an integrated approach to the earth sciences. This reviewer fails to appreciate the supposed advantages in the artificial separation of geological processes from materials in treatments of this type. This, of course, has been "classical" approach in text-books dealing with elementary geology. It is classical in the historical sense only, and recent texts have largely rejected such segmentation. Surely the time has come when a modernized treatment can justifiably and profitably be extended to books intended primarily for the layman and students of disciplines other than geology.

This book reaches for the same general goals that did *The World We Live In* published by Life Magazine several years ago. It does not come as close to achieving them. Nevertheless it is a handsome effort.

ewh

RESEARCHES ON METEORITES, edited by CARLETON B. MOORE, published by John Wiley & Sons, New York, 1962. \$7.00.

This book of 12 articles written by 17 authors and presented in 227 pages with 27 tables, 23 figures and 16 pictures is based on a symposium held at Arizona State University, March 1961. In a historical sketch of the history of meteoritical investigations from late 18th century to the present, E. L. Krinov towards the conclusion of his section said, "In view of certain specific features of meteoritics, international cooperation is the only means of successfully accomplishing a number of research tasks."

The reviewer praises Dr. Krinov not only for these words but for his continued cooperation in providing meteorite specimens for study.

The following topics are discussed:

1. The Subject and Contents of Meteorites as a Special Domain of Science by E. L. Krinov. 9 references.
2. The Measurement and Interpretation of Rare Gas Concentrations in Iron Meteorites by Peter Signer and Alfred O. C. Nier. 36 references.
3. Calculation of Production Rates of Specific Nuclides in Iron Meteorites by Parmatma S. Goel. 52 references.
4. Record of Cosmic-Ray Intensity in the Meteorites by James R. Arnold, Masatake Honda and Devendra Lal. 74 references.
5. Carbon-14 in a Stone and an Iron by Parmatma S. Goel and Truman P. Kohman. 13 references.
6. Some Metallurgical Aspects in the Study of Meteorites by T. B. Massalski. 46 references.
7. Some Observations on Deformation and Thermal Alterations in Meteoritic Iron by R. E. Maringer and G. K. Manning. 8 ref.
8. The Minerals of Meteorites by Brian Mason. 54 ref.
9. The Petrochemistry of the Achondrites by Carleton B. Moore. 14 ref.
10. The Evolution of the Meteorites—Evidence for the Co-Existence of Chondritic, Achondritic and Iron Meteorites in a Typical Parent Meteorite Body by John F. Lovering. 25 ref.
11. Present Status of the Chondritic Earth Model by A. E. Ringwood. 39 ref.
12. Recovery of Material for Meteoritic Research by H. H. Nininger.

A book containing such a variety of topics and information on 96 meteorites by these 17 investigators represents a real contribution to meteoritics and will become an important reference. Unfortunately, this book was not indexed, hence much of the information it contains is relatively inaccessible.

E. P. HENDERSON
U. S. Natl. Museum

ARTIFICIAL TWINNING OF QUARTZ. by KATHERINE V. ZINSERLING. Academy of Sciences USSR, Institute of Crystallography. Moscow, 1961, 158 pages, 110 figs., 1.05 Rubles.

A summary of work on the experimental introduction and removal of Dauphiné twinning from quartz. The various methods that have been employed are discussed in three chapters dealing respectively with pure quartz, quartz containing a relatively large amount of material in solid solution (and less readily twinned) and quartz with a mosaic or zonal structure. An introductory chapter deals with the crystallography of quartz. Studies of the percussion figures, pressure figures and thermal cracking of quartz are discussed in detail. A bibliography of 293 titles is appended, as is a Table of Contents (41 headings) but no index. The book is particularly useful in that much of the work in this general field has been done by Russian investigators and is not readily available in the periodical literature.

C. FRONDEL
Harvard University

PUBLICATIONS RECEIVED

LATE CAYUGAN (UPPER SILURIAN) AND HELDERBERGIAN (LOWER DEVONIAN) STRATIGRAPHY OF NEW YORK, by LAWRENCE V. RICHARD New York State Museum and Science Service (Albany 1, N. Y.) Bull. 386, 157 pp. 28 fig. \$3.25. A study of 175 measured Silurian-Devonian sections with detailed paleontological, stratigraphic, petrological and paleoecological analysis.